

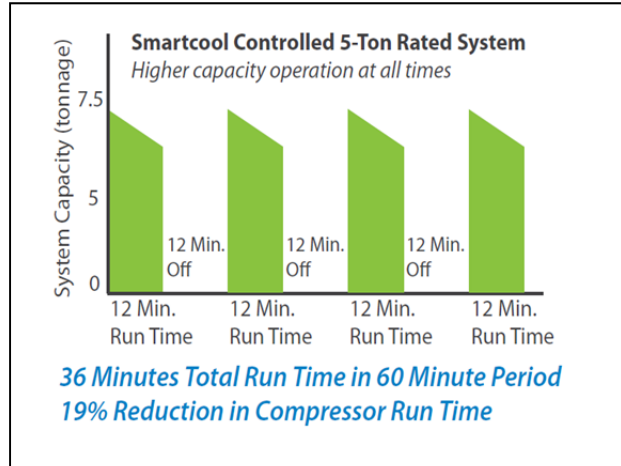
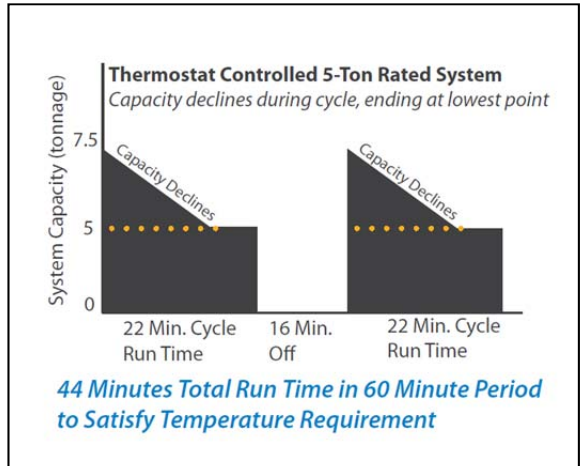
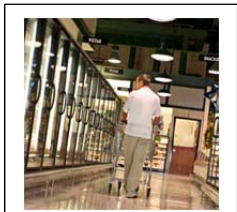


Biosirus

Intelligent Cooling

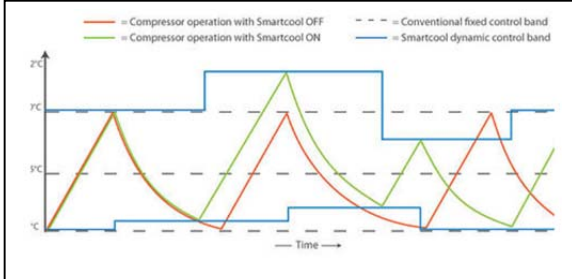
Energy Saving HVAC-R Intelligent Control Single Stage or Dual Stage Compressors

- **Application:**
 - Residential & Commercial systems (retail, supermarkets, offices, etc.)
 - Package & Rooftop systems (data centers, telecom, industrial)
 - Heat Pumps (geothermal, water based)
 - Refrigeration systems (coolers, freezers, beverage, walk-ins, cold storage)
 - Install time 30-90 minutes
- **Suitability:**
 - Refrigeration, Air-conditioners, Heat Pumps (typically 1 ton and up)
 - Scroll or Reciprocating compressors (not centrifugal)
 - Works with existing thermostat controls (analog, digital, BMS – On-Off type)
 - Appropriately sized units (not undersized units)
- **Control Unit:**
 - Wall mount (thermostat-like size) – internal or external
 - Wired in series with existing thermostat and on the same circuit
 - Requires 24V AC power supply (same as existing thermostat)
 - Override /bypass capability;
 - Screen Display for data verification (both on/off modes)
 - Fail Safe in Bypass mode
- **How Does it Work:**
 - Dynamically analyzes compressor operation (on/off, cycling, rest-time)
 - Does not violate thermostat settings
 - Predictive algorithm monitors & adapts to changing heat loads/compressor demand
 - Limits cycling to no more than 6-cycles per hour (typical Mfr. set is 10 cycles/hour)
- **Energy Savings:**
 - Typical Energy Savings Payback: 1–3 years
 - Through less compressor operation time and efficient cooling process
 - Compressors consume 75%-90% of energy – so less equates to more savings
 - 3 year Warranty / Extended Warranty Options
 - Financing Available
- **Comparison:**



Tech Talk: *Intelligent Cooling based on cooling process and a compressor's efficient operation range*

At start (top of the temperature band) the cooling system is most efficient (suction pressure is high, head pressure is low, the condenser is cold and the evaporator is warm) which allows the compressor to work at its maximum efficiency to pump large volumes of cooling refrigerant. This cooling performance is up to 50% above rated system capacity. As the temperature in the controlled space cools (office, refrigerator, etc.) the system's capacity to continue removing heat from the space drops dramatically. At this point, the compressor uses more energy to produce that temperature drop. **At the bottom of the temperature band the system uses about twice as much energy (and time) per degree of cooling.**

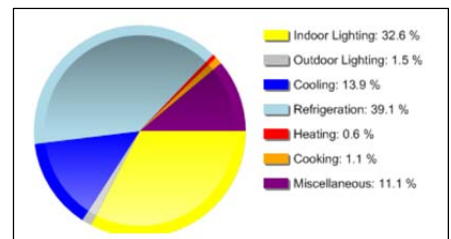


The optimization lies in recognising this dynamically (as heat loads often change) and for the Intelligent Controller to determine how long the compressor will run, give it "rest" and restart it again at it most efficient operating condition. By helping the compressor run in its most efficient state, the total run time is reduced. A thermostat does mere temperature on-off control.

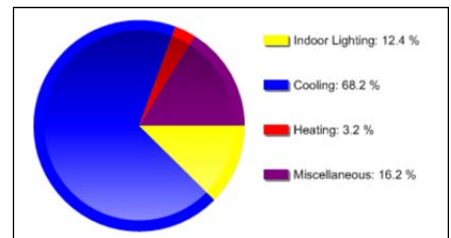
Typical Electricity Consumption

(Source: US DOE)

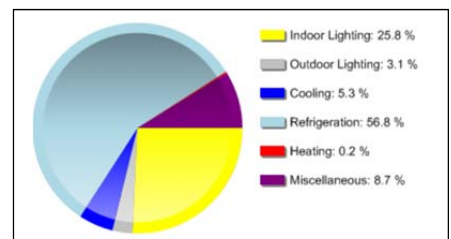
Grocery Store (60,000 sq. ft.):



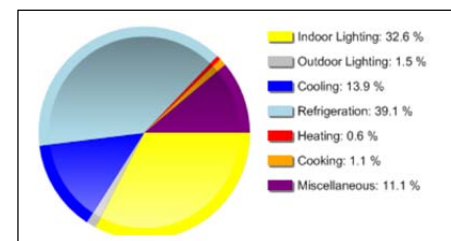
Data Centers (10,000 sq. ft.):



Convenience/Pharma Store (5,000 sq. ft.):



Restaurant (10,000 sq. ft.):



And Savings Too:

Compressors consume 75%-90% of system power. Hence optimizing this is key. The savings lie in:

- low energy consumption (kWh) – about 10%-20%
- Lower demand (kW) charges – about 10%

Typical payback is about 12-36 months

Best Value Applications:

The most important parameters are:

- (1) Size of the unit(s), (2) ambient temperature, (3) cooling gradient,
- (4) Hours of operation per day, (5) electricity tariff rate, and
- (6) Demand charges (if levied).

Parameters	Platinum Savings	Gold Savings	Silver Savings	Bronze Savings
Size of the Unit(s) (Tons)	1+	1+	5+	10+
Ambient Temp. (Deg. C / F)	30+/86+	25-30/77-86	20-25/68-77	15-20/59-77
Cooling Gradient (Deg C/ F)	20-30+/68-86	10-20/50-77	10-20/50-77	10-20/50-77
Hours of operation per day	15+	10-15	6-8	6-8
Electricity Tariff (US\$/kWh)	0.15+	0.17+	0.17+	0.20+
Demand Charges (US\$/kW)	varies	varies	varies	varies
Typical Pay back (simple ROI)	1 year	1.5 Years	2 Years	3 Years
Typical Applications	All	All	All	Big Box Retail, Supermarkets, Commercial, Small Office

Do the math for number of units in each facility – the savings are huge.

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Call us for any details or a trial project